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SUBSTRATE ADHESION APPARATUS

[Abstract]

PROBLEM TO BE SOLVED: To provide a substrate sticking device which can perform sticking of substrates in a vacuum with high accuracy.

SOLUTION: In the substrate sticking device which sticks both substrates in a vacuum with an adhesive provided in at least either of substrates by disposing to face the substrates to be stuck while holding vertical, respectively, and narrowing an interval while performing positioning, a first table which makes one of both substrates fix on an upper face or on an undersurface freely detachably, and a

second table which makes the other substrate fix on the undersurface of on the upper face freely detachably are provided in a vacuum chamber so that the upper face and the undersurface which make each substrate fix may face each other. One of both tables is movably joined airtightly with the vacuum chamber through an elastic body and the one table is provided with a driving means which moves to an atmospheric side of the vacuum chamber divided by the elastic body at least in a horizontal direction to the vacuum chamber. The other table is provided with the driving means which at least narrows the interval between the substrates.

[Claim(s)]

[Claim 1] A substrate adhesion apparatus which holds substrates to be adhered to be faced up and down to each other, narrows a spacing while positioning and adheres both substrate in a vacuum with an adhesive applied to at least several substrates, wherein it has a first table which fixes either side of both substrates to a surface or a lower face to be attached and detached freely and a second table which fixes another side of both substrates to a lower face or a surface to be attached and detached freely to be faced to a surface or a lower face which fixes each substrates in a vacuum chamber so that one of both tables is combined with the vacuum chamber to be movable airtightly through an elastic body, this table has the driving means horizontally moved to the atmospheric side of the vacuum chamber divided with said elastic body, while at least one of both tables has a driving means which narrows a spacing in which the substrates are faced with each other.

[Claim 2] The substrate adhesion apparatus of claim 1, wherein the driving means of one table moves one table through a linear guide in the vaccum chamber, and a folding box-like elastic body between the vaccum chamber and the linear guide and a vacuum seal and bearing in the atmospheric side divided with said

elastic body are formed.

[Claim 3] The substrate adhesion apparatus of claim 1, wherein one table is a lower table in the vaccum chamber.

[Claim 4] The substrate adhesion apparatus of claim 1, wherein one table has a perpendicular driving means which narrows a spacing between the substrates, and a driving means of another table shares only a horizontal driving.

[Claim 5] The substrate adhesion apparatus of claim 1, wherein a reserve chamber and an atmosphere releasing chamber are provided before and after the vacuum chamber, each chambers are divided with the gate valve and are in communication with the atmosphere by an opening of the gate valve to convey the substrate.

[Title of the invention]

SUBSTRATE ADHESION APPARATUS

[Detailed Description of the Invention]

[Field of the Invention]

The present invention relates to a substrate adhesion apparatus, in particular, a substrate adhesion euipment suitable to assemble a liquid crystal display panel and the like which holds substrates to be adhered to be faced in a vaccum chamber and narrows a spacing to adhere the substrates.

[Description of the Prior Art]

In manufacturing a liquid crystal display panel, there is a process which adheres two glass substrates having mounted a transparent electrode and thin film transistor array with an adhesive (henceforth called a sealing agent) applied to the periphery section of a substrate with a spacing closed extremely of about several µm (henceforth, the substrate after adhesion is called a cell) to seal a liquid crystal in a space formed.

There is a process proposed by JP 10-26763-A in which drops a liquid crystal on one substrate patterned with a pattern closed with a sealing agent without equipping with an inlet in the seal of the liquid crystal, arranges one

substrate on another substrate in a vaccum chamber and approaches the upper and lower substrates to adhere them.

[Problem to be Solved by the Invention]

In the above prior art, the lower substrate lays a maintenance of the substrate in a vacuum in a flat stage, however, the upper substrate supportes a suitable part of the periphery by a member and the like on a pin. Then, the upper and lower substrates narrow a spacing to performe the adhesion after positioning each other, however, when positioning, a center section of the upper substrate is bent by gravity, the exact positioning of the upper and lower substrates is difficult, and the amount of bending increases more and more as a size of the substrate increases so that a display panel tends to be large sized, and accordingly, the exact adhesion of the substrates becomes more difficult in the above prior art.

There is a problem that, because the upper and lower substrates are conveyed directly in a vacuum chamber and the inside of the chamber is exhausted from atmospheric pressure to a vacuum to increase the exhaust time, it is impossible to improve the productivity.

Therefore, the purpose of the present invention is to provide a substrate adhesion apparatus which can perform an adhesion of the substrate in a vacuum at higher precision.

Another purpose of the invention is to provide a substrate adhesion apparatus of high productivity which can perform an adhesion of the substrates at higher presion and higher speed although the substrates are large sized.

[Means for Solving the Problem]

A feature of the present invention to achieve the above-mentioned purpose is to provide a substrate adhesion apparatus which holds substrates to be adhered to be faced up and down each other, narrows a spacing while positioning and adheres both substrate in a vacuum with an adhesive applied to at least several substrates, wherein it has a first table which fixes either side of both substrates to to a surface or a lower face to be attached and detached freely and a second table which fixes another side of both substrates to a lower face or a surface to be attached and detached freely to be faced to a surface or a lower face which fixes each substrates in a vacuum chamber so that one of both tables is combined with the vacuum chamber to be movable airtightly through an elastic body, this table has the driving means horizontally moved to the atmospheric side of the vacuum chamber divided with said elastic body, while at least one of both tables has a driving means which narrows a spacing in which the substrates are faced each other.

Aso, the present invention is characterized in that the driving means of one

table moves one table through a linear guide toward the vaccum chamber, whike an elastic body between the vaccum chamber and the linear guide and a vacuum seal and bearing in the atmospheric side divided with said elastic body are mounted. And, the elastic body is a folding box-like elastic body such as things which bonds the periphery edges each other and inner circumference edges each other of bellows or things which bond a plurality of round dish-shaped diaphrams in turn airtightly

Another feature of the present invention is that one table is a table placed in the lower part within the vacuum chamber.

Another feature of the present invention is that one table has a perpendicular driving means which narrows a spacing between the substrates, and a driving means of another table shares only a horizontal driving.

Another feature of the present invention is that a reserve chamber and an atmosphere releasing chamber are provided before and after the vacuum chamber, each chambers are divided with the gate valve and are in communication with the atmosphere by an opening of the gate valve to convey the substrate.

[Embodiment of the Invention]

Hereafter, an embodiment of the present invention is explained referring to the drawings. In the Fig. 1, the reference 1 is a substrate adhesion apparatus and it

has a reserve vacuum chamber R1, a vacuum adhesion chamber (vacuum chamber) R2 and an atmosphere releasing chamber R3. The references 2 to 5 are the gate valves mounted in inlet and outlet of each chambers R1 to R3. Also, in structure explanation, when the reserve vacuum chamber R1, the vacuum adhesion chamber R2 and the atmosphere releasing chamber R3 are called, it means a housing composing each chambers.

In the interior of each chambers R1-R3, a conveyance way which conveys the substrates to be adhered from the left to the right of drawing is located in the same horizontal position, and a concrete configuration is explained in the Fig. 2.

As mentioned hereinafter, later, the vacuum adhesion chamber R2 except for the reserve vacuum chamber R1 and the atmosphere releasing chamber R3 is the substrate adhesion apparatus in a narrow sense.

Fig. 2 shows the internal structure of the reserve vacuum chamber R1. 11 is a plurality of conveyance rollers mounted in the interior of the reserve vacuum chamber R1, and conveys the conveyance jig which lays the substrates to be adhered mentioned hereinafter in both right and left directions in the drawing by forward-inverse rotation.

The outer air and the interior of the reserve vacuum chamber R1 can be vacuum interrupted by closing of a gate valve 2. 6 is a gate valve mounted in a

stand of the reserve vacuum chamber R1, and the interior of the reserve vacuum chamber R1 can be vacuum exhausted with a vacuum pump 12 by opening of the gate valve. 7 is an atmosphere releasing valve, and the interior of the reserve vacuum chamber R1 can be purged with atmosphere gas and return it to atmospheric pressure by opening of the atmosphere releasing valve.

A gate valve 3 is mounted between the reserve vacuum chamber R1 and the vacuum adhesion chamber R2, and the internal pressure of each chambers can be changed independently.

Fig. 3 shows the internal structure of the vacuum adhesion chamber R2. Although omitted in this drawing, the same valve as the valve 6 of the reserve vacuum chamber is mounted in the lower part of the vacuum adhesion chamber R2 and the interior of this chamber can be vacuum exhausted with the vacuum pump (not shown).

21 is a lower table and the supporting structure is mentioned hereinafter. 22 is a plurality of conveyance rollers mounted in the interior of the vacuum adhesion chamber R2 so that the lower table 21 may be inserted into a front and a rear in drawing, and conveys the conveyance jig which lays the substrates to be adhered mentioned hereinafter in both right and left directions in the drawing by forward-inverse rotation.

In the lower table 21, its plinth section 21a penetrates aperture R2A in the lower part of the vacuum adhesion chamber R2, and the lower table 21 is supported by XYΘ stage 23 to the plinth section 21a. XYΘ stage 23 consists of XY stage 23a and Θ stage 23b. XY stage 23a is supported movably in the XY direction by upper and lower 2-stage linear guide which crossed the lower table 21 in the XY direction.

25 is a cross linear guide which moves the driving block 24 to X-axial direction which is right and left of drawing and Y-axial direction entations which is front and rear of drawing to the vacuum adhesion chamber R2 by a driving motor (not shown) with a driving motor 26, and 27 is a linear guide in which the driving motor 26 press the driving blok 24 to X-axial direction to be moved, even if the driving block 24 moves to Y-axial direction.

Θ stage 23b is located in the inside of XY stage 23a, and that it can be rotated to XY stage 23a through vacuum seal 29 with the rotation bearing 28 by a driving motor 30. The lower table 21 carrying the substrates is fixed fixed on Θ stage 23b, and when the driving motor 30 operates, the lower table 21 rotates to X-Y stage 23a or the vacuum adhesion chamber R2 through the vacuum seal 29 with the rotation bearing 28.

31 is the bellows (elastic body) mounted between the vacuum adhesion

chamber R2 and the driving block 24 to a perforation R2A and holds the airtight in the vacuum adhesion chamber R2 to atmosphere, even if the driving block 24 moves to the cross linear guide in XY direction to move the the lower table 21. Also, to rotation of plinth 21a, the vacuum seal 29 holds the airtight in the vacuum adhesion chamber R2.

32 is a pin for substrate rising-and falling mounted in the lower table 21, and the lower limit of the pin is contacted anf attached to the upper limit of the driving axis of the pneumatic cylinder 33 mounted in the lower part of the vacuum adhesion chamber R2. Therefore, even if the lower table 21 moves in XY direction of each front, rear, left and right, a pin 32 only slides 33 horizontally on the upper limit pin receiving section of the driving axis of the pneumatics cylinder 33. By the reasons of the configuration of the conveyance jig mentioned hereinafter, the pins 32 have a total of three pins, one is located in the left end center section of the lower table 21 and each of the others are located in both sides of the width direction perpendicular to the rightward conveyance direction.

35 is the frame mounted in the upper exterior of the vacuum adhesion chamber R2, and a servo motor 36 having the rotation axis extended to the lower part is fixed to the frame 35. The rotation axis of the servo motor 36 is screwed with the nut 39 fixed to the arm 38 of the shaft 37 penetrating the vacuum adhesion

chamber R2. 40 is a guide holding the airtight of the vacuum adhesion chamber R2 with said shaft 37. The upper table 42 is fixed to the lower limit of the shaft 37 through a pressure plate 41 to be faced to the lower table 21. The upper table 42 moves up and down through the shaft 37 by operation of the servo motor 36.

As mentioned hereinafter, in order to carry out a positioning and alignment by fixing the substrates on each tables 21 and 42, there is a glass-made window 43 mounted airtightly in the perforation penetrating the vacuum adhesion chamber R2, and the image recognition camera 44 is mounted in the frame 35 on this window 43. Also, a part of the upper table 42 under directly the window 43 has the perforation, and the positioning mark of the upper substrate fixed on the lower face of the upper table 42 and the lower substrate fixed on the surface of the lower table 21 can be read now.

Each tables 21 and 42 have an electrode for electrostatic adsorption and are constituted so that adsorption and suction of the substrate with static electricity may be carried out. Therefore, in the following description, both the tables 21 and 42 may be called the adsorption plates.

Although it is a reason for supporting elastically airtightly the lower table 21 by the bellows 31, when the vacuum adhesion chamber R2 is made to a vacuum, the atmospheric pressure which makes the outer diameter of bellows 31 to a

hydraulic side is applied in the direction pushing up the plinth 21a. A difference of the atmospheric pressure in this case and gravity of the plinth 21a and the like is received with cross linear guide 25 and the rotation bearing 28 and a loading is not provided with the bellows 31. If the atmospheric pressure in this case and gravity of the plinth 21a and the like are made equivalent, it is not needed to recognize the atmospheric pressure applied to the lower table (adsorption plate) 21 or bellows 31 in moving in each of XY direction of the lower table (adsorption plate) 21 upon positioning and aligning the substrates so that positioning and alignment of the substrates can be performed smoothly. Also, since the driving system of the lower table (adsorption plate) 21 exists in the atmosphere, the size of the vacuum adhesion chamber R2 can be limited to the narrow space of the extent containing internally each adsorption plates 21 and 42 required for the adhesion of the upper and lower substrates so that the interior can be exhausted at a high speed.

The vacuum adhesion chamber R2 and the atmosphere releasing chamber R3 can be interrupted each other by the gate valve 4.

Fig. 4 shows the internal structure of the atmosphere releasing chamber R3. 51 is a conveyance roller which loads and carries in the cell adhered to the vacuum adhesion chamber R2 on the flat adsorption plate 52 by forward and inverse rotation. An adsorption hole for vacuum adsorption of the substrates on the flat

adsorption plate 52, and by raising the vacuum suction chamber 53 mounted movably up and down in the interior of the atmosphere releasing chamber R3 to lay and integrate the flat adsorption plate 52, when the atmosphere releasing chamber R3 is opened, it is constituted to carry out vacuum suction of the cell onto the flat adsorption plate 52 through the vacuum suction chamber 53 by vacuum pulling through a tube 54.

8 is the gate valve mounted in the lower part of the atmosphere releasing chamber R3 and can open the atmosphere releasing chamber R3 to the atmosphere by the atmosphere opening valve 9 while connecting to the vacuum pump 55.

The rise-and-fall pin 56 which penetrates the vacuum suction chamber 53 with the flat adsorption plate 52 to raise the cell on the flat adsorption plate 52 is mounted in the lower part of the vacuum suction chamber 53. 57 is a pneumatic cylinder which operates the rise-and-fall pin 56. Four pneumatic cylinders 57 are located in front, rear, left and right of the rise-and-fall pin 56 and and support the cell at four corners.

A gate valve 5 located in the outlet of the atmosphere releasing chamber R3 and takes out the cell which pressurized with the atmospheric pressure by valve opening to carry out the adhesion by a robot hand etc.

Next, in a process for adhering the substrates with the present apparatus 1 to manufacturing the cell, a sequential explanation is made from a state which carries in the substrate to the reserve vacuum chamber R1.

In Fig. 5, 14 has a コ-shaped appearance having removed a side in a flame, and is a conveyance jig which lays the substrates B1, B2 to be adhered in in a lattice, projection and the like of the upper and lower parts of an internal wall in a spacing up and down. The lower substrate (bottom substrate) B1 is one which applies a sealing agent 15 to a frame type at the periphery section of a surface and drops liquid crystal 16 to a plurality of parts within a certain limit. On this substrate B1, a certain spacing from a surface of the substrate B1 is maintained with a projection in the inernal wall of the conveyance jig 14 to lay the upper substrate (top substrate).

After opening the gate valve 2 in the state of closing the gate valve 3 is closed to carry in th upper and lower substrates B1, B2 mounted in the conveyance jig to the reserve vacuum chamber R1 14 with the conveyance roller 11, the gate valve 2 is closed. Thereafter, the gate valve 6 is opened to exhaust the reserve vacuum chamber R1 the vacuum pump 12 at a high speed.

At the time of reaching a degree of vacuum of the reserve vacuum chamber R1 to the almost same value as that of the vacuum adhesion chamber R2, the gate

valve 3 is opened to forward rotate the conveyance roller 22 of the vacuum adhesion chamber R2 with the conveyance roller 11 of the reserve vacuum chamber R1 and carry in the conveyance jig 14 in the vacuum adhesion chamber R2. Also, the vacuum adhesion chamber R2 is exhausted by the vacuum pump (not shown) in advance.

Next, in the Fig. 6, the situation of transferring the substrates B1, B2 on conveyance jig top 14 to the upper and lower adsorption plates 21, 42 within the vacuum adhesion chamber R2 is explained.

After the conveyance jig 14 moves to the vacuum adhesion chamber R2, the servo motor 36 is operated to guide the upper adsorption plate 42 to a guide 40 by the shaft 37 to to descend together with a pressurization plate 41 and approach to the upper substrate B2. In this state, by applying a voltage to an electrode for electrostatic adsorption containded internally in the upper adsorption plate 42, the upper substrate B2 is adsorbed electrostatically to the lower face of the upper adsorption plate 42 and a pressurization plate 41 is raised to lift the upper substrate B2 from the conveyance jig 14. By furthermore raising a pin 32 with the pneumatic cylinder 33, the lower substrate B1 is also raised from the conveyance jig 14. Also, at tis time, both substrates B1 and B2 are still separaed from each other.

In this state, by inversely rotating both conveyance rollers 11 and 22 to

return the conveyance jig 14 to the reserve vacuum chamber R1, the gate valve 3 is closed to descend the pin 32 to apply a voltage to the electrode for electrostatic adsorption contained internally in the lower adsorption plate (lower table) 21 and adsorbe electrostatically the lower substrate B1 onto the lower adsorption plate 21.

Next, the upper adsorption plate 42 is desceneded to the lower adsorption plate 21 side and the upper substrate B2 is approached to the lower substrate B1.

In this state, through the window 43 mounted in the upper part of the vacuum adhesion chamber R2, the positioning mark located in each substrate B1, B2 is read with the image recognition camera 44 to measure the positon by the image processing, each stages 23a and 23b of the XYθ stage 23 are moved slightly and a higher precision positioning (a positioning of the subtrates B1, B2 each other) is performed.

In such slight movement, the bellows 31 maintains vacuum in the vacuum adhesion chamber (vacuum chamber) R2 to movement of XY direction, and the vaccum seal 29 maintain vacuum in this chamber to movement of θ direction.

After positioning, the pressurization plate 41 is descended a position that the lower face of the upper substrate B2 contact with a sealing agent 15 and liquid crystal 16 on the lower substrate B1 to pressurize both substrates B1 and B2. In such descent process, the positioning mark is read to measure a position by the

image processing, and it is made for a position difference location of the upper and lower substrates not to occur.

When the upper substrate B2 contacts with the sealing agent 15, the liquid crystal 16 becomes to a state surrounded by both substrates B1, B2 and the sealing compound 15.

The upper and lower substrates B1, B2 is passed through each perporations mounted a window (not shown) of the vacuum adhesion chamber R2, the pressurization plate 41 and the upper adsorption plate 42 in the pressurization state, UV light is irradiated to UV adhesive 15 applied in advance between both substrates B1, B2 by using the UV irradiation light source (not shown), and both the substrates are fixed temporarily. Until performing such temporary fixing, both substrates B1, B2 are adsorbed to each of the upper and lower adsorption plate in parallel each other to allow a higher prcesion performance of the positioning, and also, a parallel spacing of both substrates B1, B2 is narrowed more and more so that a spacer for maintaining constantly a spacing between both substrates B1, B2 distributed can be located in an intact position.

Next, the voltage applied to to the electrode for electrostatic adsorption contained internally in the lower adsorption plate 21 is turned off, the pressurization plate 41 is raised while raising the pin 32 to apply a voltage the electrode for

electrostatic adsorption contained internally in the upper adsorption plate 42, and the upper and lower substrates B1, B2 united by temporary fixing are adsorbed electrostatically to the lower face of the upper adsorption plate 42. Then, the pin 32 is descended to open the gate valve 4 between the vacuum adhesion chamber R2 and the atmosphere releasing chambers R3 made to have the same degree of vacuum in advance to rotate inversely the conveyance roller 51 of the atmosphere releasing chamber R3 with the conveyance roller 22 of the vacuum adhesion chamber R2 and carry in the flat adsorption plate 52 to the vacuum adhesion chamber R2.

Fig. 7 shows a state that the flat adsorption plate 52 is moved to the lower part the upper adsorption plate 42 of the vacuum adhesion chamber R2.

Next, by descending the upper adsorption plate 42 together with the pressurization plate 41 onto the flat adsorption plate 52 to turn off the voltage applied to the electrode for electrostatic adsorption contained internally in the upper adsorption plate 42, the substrate B1, B2 united by temporary fixing are transferred onto the flat adsorption plate 52.

Next, after flat adsorption plate 52 is conveyed to the atmosphere releasing chamber R3 by rotating forwardly the conveyance roller 51 of the atmosphere releasing chamber R3 with the conveyance roller 22 of the vacuum adhesion

chamber R2, the gate valve 4 is closed.

After carrying in the flat adsorption plate 52 to the atmosphere releasing chamberR3, the the vacuum suction chamber 53 is raised with the rise-and-fall shaft 58 (refer to Fig. 4) to contact the lower face of the flat adsorption plate 52 on the conveyance roller 51 and the vacuum suction chamber 53 is exhausted through the tube 54.

In this state, when the gate valve 8 is closed and the atmosphere releasing valve 9 is opened to open the atmosphere releasing chamber R3 to the atmospheric pressure, the atmospheric pressure is applied to the temporarily fixed substrates B1, B2 in the sate vacuum sucked in the flat adsorption plate to pressurizes them. In this case, the flat adsorption plate 52 maintains the surface smoothness of the temporarily fixed substrates B1, B2.

After the pressurization by the atmospheric pressure, the vacuum action of the vacuum suction chamber 53 through the tube 54 is stopped to open to the atmosphere, the pin 56 is raised, the gate valve 5 is opened to insert the robot hand (not shown), and after the cell pressurized with the adhesion atmospheric pressure is transferred onto the robot hand, it is taken out .

Where the gate valves 3, 4 is opened and the vacuum adhesion chamber R2 is in communication wuth the reserve vacuum chamber R1 or the atmosphere

releasing chamberR3, since each of these chambers R1, R2 maintains vacuum, it is not needed to make the vacuum adhesion chamber R2 to vacuum, and since it is not occurred to apply newly the atmospheric pressure to the vacuum adhesion chamber R2 to deform it, the adhesion of both substrates B1, B2 can be performed time-efficiently and at higher precision.

And, since it is possible to perform in parallel the actuation that the gate valve 3 is opened to carry in the substrates B1, B2 mounted on the conveyance jig 14 from the reserve vacuum chamber R1 to the vacuum adhesion chamber R2 at the time of carrying out a suitable substrate to the atmosphere releasing chamber R3 together with the flat adsorption plate 52 and closing the gate valve, a productivity can be increased further.

The present invention is not limited to the above-mentioned embodiment and can also be carried out in the following modes and the like.

1. The vacuum adhesion chamber has not the reserve vacuum chamber or the atmosphere releasing chamber and the like, and carries in and out each substrates, or the cell after adhesion by the robot hand the like. Although the latency time for exhausting vacuum adhesion chamber is required since there is no communication with the reserve vacuum chamber or the atmosphere releasing chamber, the time for exhausting is shortened since there is no driving system of a

table within the vacuum adhesion chamber and the volume of the vacuum adhesion chamber is small, and vacuation does not take time amount.

2. A material of the so-called bellow or wrinkle shape which is combined airtightly with periphery and inner circumference of a plurality of circular ring dish-shaped metal plate is used as an elastic body which replaces bellows 31. Also, in the bellows, considering the functional separation of an airtightness and an elasticity, a material of a concentric dual structure of a tube-type elastic elastic body for the airtightness and a spiral sprin for elasticity can be used.

3. In Fig. 3, the lower table is fixed in the XY-axial direction, and the upper table is movable in each of the XYθ direction in an elastic body, a linear guide, a vacuum seal, a rotation bearing and the like. In this case, since a weight of the upper table is transferred to the vacuum adhesion chamber through the linear guide, there is little loading to the elastic body.

4. In Fig. 3, a fixing of the substrates of the lower table and the upper table is performed in parallel to a vacuum adsorption. In the case that the vacuum adhesion chamber is in vacuum state, the substrate is prevented from falling owing to disappearance of substrate adsorption force in the upper table and a drop-preventing projection for maintaining the substrate in the lower part of the upper table until an electrostatic adsorption is made is mounted separably so a substrate

pressurization is not disturbed.

5. The rise-and-fall means of the lower adsorption plate 21 is contained internally in plinth section 21a to raise the lower adsorption plate 21 to the upper adsorption plate 42 and perform temporary fixing of the substrates B1, B2.

[Effect of the Invention]

As explained above, according to the substrate adhesion apparatus of the present invention, an adhesion of the substrate in a vacuum can be performed at higher precision.

[Brief Description of the Drawings]

Fig. 1 is a drawing showing the configuration of the substrate adhesion apparatus which is an embodiment of the present invention.

Fig. 2 is a cross-sectional view showing the internal structure of the reserve vacuum chamber in the substrate adhesion apparatus of Fig. 1.

Fig. 3 is a cross-sectional view showing the internal structure of the vacuum adhesion chamber in the substrate adhesion apparatus of Fig. 1.

Fig. 4 is a cross-sectional view showing the internal structure of the atmosphere releasing chamber in the substrate adhesion apparatus of Fig. 1.

Fig. 5 is a drawing for explaining a substrate adhesion process in the reserve vacuum chamber shown in Fig. 2.

Fig. 6 is a drawing for explaining the substrate adhesion process in the vacuum adhesion chamber shown in Fig. 3.

Fig. 7 is a drawing for explaining the substrate adhesion process in the vacuum adhesion chamber shown in Fig. 3.

[Meaning of numerical symbols in the drawings]

R1: Reserve vacuum chamber

R2: Vacuum adhesion chamber (vacuum chamber)

R3: Atmosphere releasing chamber
B2: upper substrate
B1: lower substrate
1: Substrate adhesion apparatus
2-6, 8: gate valve
7, 9: Atmosphere releasing valve
11, 22, 51: Conveyance roller
12, 55: Vacuum pump
15: Sealing agent
16: Liquid crystal
21: lower table (adsorption plate)
21a: Plinth section
23: XYθ stage
23a: XY stage
23b: θ stage
26, 30: Driving motor
25, 27: Linear guide
24: Driving block
28: Rotation bearing
29: Vacuum seal
31: Bellows (Elastic body)
33, 57: Pneumatic cylinder
36: Servo motor
42: Upper table (Adsorption plate)
43: Window
44: Image recognition camera

* 국문 번역문에서, bulb(벌브)를 모두 valve(밸브)로 번역한 것 같습니다만,
영역에 있어서 원문에 충실히 함을 원칙으로 하여 valve로 번역하였습니다.
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